

EFFECT OF UNDERWATER EXPLOSIONS ON LIVE-CAGED FISH

by Art Whitney

The University of Wisconsin Geophysical and Polar Research Center began seismic work in the Bitterroot Valley on May 20, 1963. Ten to twenty-five pounds of nitro-carbonitrate were detonated in each blast in test sites in the Bitterroot River and its adjoining sloughs. Through a misunderstanding of their responsibilities to landowners, sportsmen, and the Fish and Game Department; the Wisconsin crew generated enough local opposition to their project to shut it down on May 22. No charges were detonated from May 23 through May 28, while Wisconsin personnel gave the publicity to their project that should have been given several weeks prior to its inception.

On May 29, Fish and Game personnel, the University of Wisconsin crew, and interested sportsmen and landowners attempted to determine the effect of the under water blasts on fish. Two, 15-pound charges were detonated in a fast riffle area of the Bitterroot River approximately six miles north of Florence. Water velocity was estimated at 10-15 mph, and depths over the two charges were six and four feet respectively. No fish were seen after either blast. Six observers were stationed at intervals from 100 feet to 750 feet downstream from the blast point, and two observers cruised this area in a boat immediately following the explosion.

Two other experimental charges were detonated in a small side channel of the Bitterroot River about one mile south of Florence. This channel contained about one-tenth or less of the main river's flow and velocity was estimated at 1-2 mph. Prior to the detonation of the first charge, hatchery rainbow trout were placed in test cages near the blast area in the following pattern (See Figure 1.). Four, 3-inch fish were placed in each of five, one-quarter-inch, hardware-cloth cages approximately 3" x 3" x 12" in size. One cage was anchored near the bottom, 30 feet downstream from the charge and the other four cages were spaced at 15-foot intervals downstream. Fifteen feet below cage No. 5 a copper-screen cage of the same approximate size, containing one 5-inch rainbow, was anchored. Thirty feet upstream from the charge, a wire-frame, bobbinet-covered cage approximately 6" x 6" x 12" containing four, 7-inch rainbow was anchored. Water depth was approximately four feet over the two cages 30 feet from the charge and two to three feet over the other six. All seven cages were near the center of the channel. An open-topped, metal-framed, bobbinet-covered cage, about $2\frac{1}{2}'$ x $2\frac{1}{2}'$ x $3\frac{1}{2}'$ was placed in 1-1 $\frac{1}{2}$ feet of water near the shore, immediately opposite the charge. This cage was approximately 20 feet from the charge and contained two, 7-inch and two, 3-inch trout.

The water depth was seven feet over the first charge, which contained 15 pounds of nitro-carbonitrate. When the charge was detonated, it lifted a column of water an estimated 150 feet high, caused a wave which washed two fish out of the open-topped cage, deepened the 7-foot hole to 11 feet, and killed a number of Columbia coarse-scaled suckers, squawfish, Columbia River chubs and red-sided shiners. Forty of these fish were recovered by dip nets, and an unknown number washed downstream undetected due to extremely turbid water following the blast. Two of the recovered fish (one 10-inch sucker and one 4-inch squawfish) regained equilibrium.

All trout remaining in the eight live cages were active and in apparent good condition.

The one, upstream live cage was moved to 15 feet from the blast point, the other cages were replaced in their original positions and a 25-pound charge of nitro-carbonitrate was placed in the same place as the first charge (now 11 feet deep rather than 7 feet) and detonated.

Thirteen more rough fish, of the same species, were recovered following the second blast, plus one 7-inch rainbow presumed to have been washed out of the open-topped live cage by the first charge. This rainbow regained equilibrium and escaped during handling.

The four 7-inch rainbow in the cage 15 feet upstream from the blast were killed, the two remaining fish in the open-topped cage were washed out, and one of the four, 3-inch rainbow in the cage 30 feet downstream from the blast lost equilibrium but regained it again. All other test fish were active and appeared normal.

Live-caged fish were held for 18 hours, at which time the one, 3-inch rainbow which had lost equilibrium following the second blast was dead. All other test fish were active and appeared to be in good condition.

Several of the retrieved squawfish, suckers and chubs were cut open and found to have varying degrees of ruptured kidneys, spleens and air-bladders; and ribs torn loose from the backbone. The four trout, killed in the cage 15 feet from the second blast, exhibited none of these characteristics. In one, the heart cavity was filled with blood, but the rest of its internal organs, and the internal organs of the other three, appeared normal to a superficial examination.

As a result of these tests, and some experimental seismic work by the Wisconsin crew, the following restrictions were agreed upon for the remaining geophysical work, to insure minimal damage to the game fish resource of the Bitterroot:

1. All test blasts possible will be made in holes in the ground and in pond and slough areas.
2. The minimum number of test blasts necessary in the main river will be kept under 15 pounds of nitro-carbonitrate and will be made in fast, riffle sections and at the time of day (0800 - 1600) when game fish are not expected to be in those areas during high water.

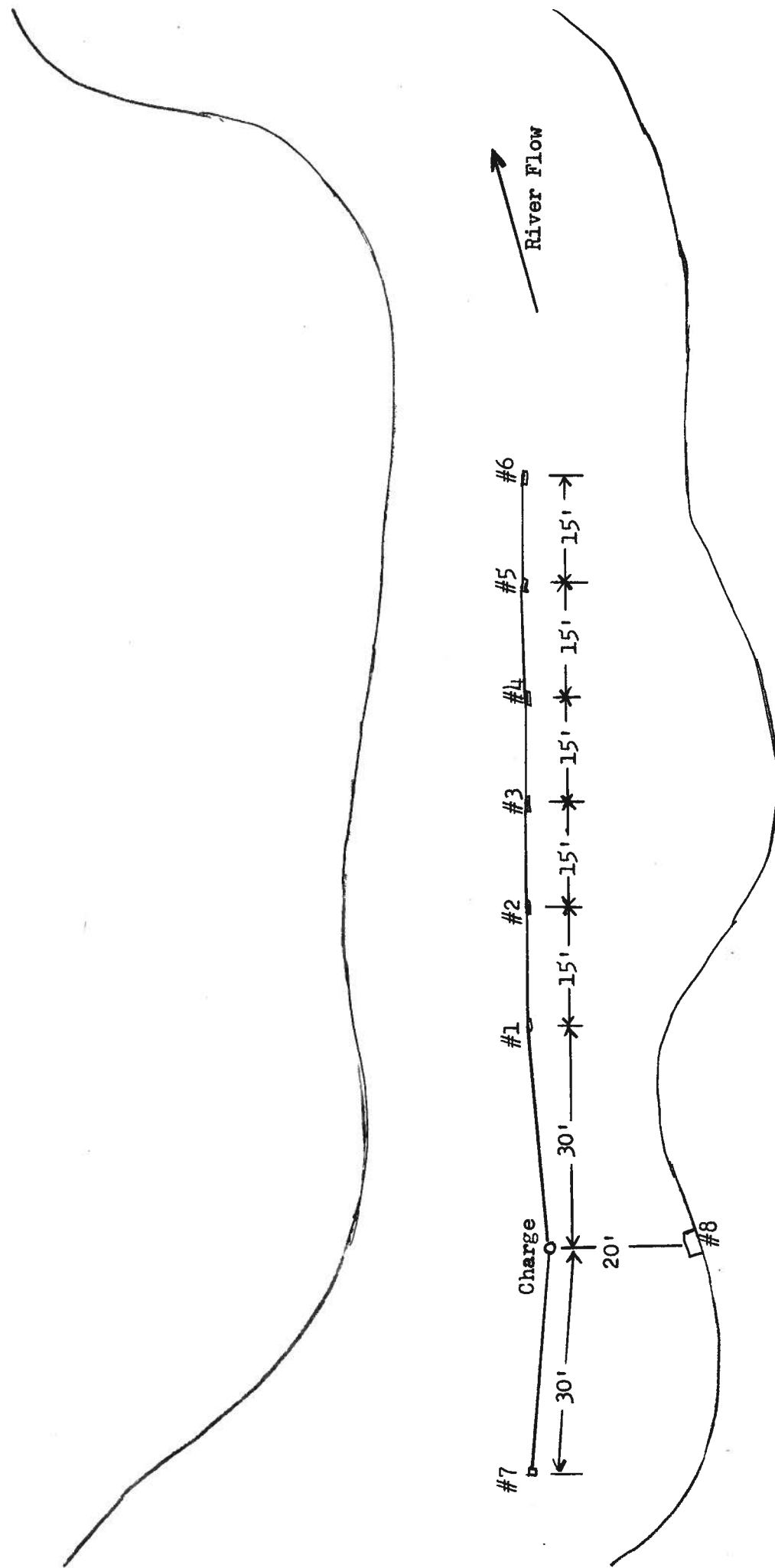


FIGURE NO. 1

Diagram showing location of test cages and explosive charge for 15-pound shot of nitro-carbonitrate in Bitterroot side channel.